

**Taxonomical revision of *Trochoidea (Xerocrassa) llopisi* Gasull, 1981
(Gastropoda, Pulmonata, Hygromiidae, Geomitrinae), from the
province of Castellón, Spain**

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The specimens on which Gasull (1981) based his description of *Trochoidea llopisi* were restudied. This material was compared with that collected by the authors at the type locality. It turned out that the type material belongs to two species: *Trochoidea geyeri* (Soós, 1926) and *Candidula camporobensis* (Fez, 1944). The lectotype, selected here, belongs to *T. geyeri*. Therefore, *T. llopisi* has to be considered a junior synonym of *T. geyeri*.

Key words: Geomitrinae, *Trochoidea llopisi*, *Trochoidea geyeri*, *Candidula camporobensis*, taxonomy, Spain.

INTRODUCTION

The striking conchological convergence among several species of genera belonging to either the Hygromiinae or the Geomitrinae, resulting maybe from adaptations to a particular kind of environmental conditions, necessitates a study of the genitalia of most species of these genera to enable their correct classification (Ortiz de Zárate, 1950; Gittenberger, Backhuys & Ripken, 1970; Aparicio, 1983, 1986; Manganelli & Giusti, 1987; Gittenberger, 1993).

Gasull (1981) described *Trochoidea (Xerocrassa) llopisi* as a new species, which he considered endemic to the massif of Peñagolosa, province of Castellón, Spain (fig. 5). He did so on the basis of shell morphology and an anatomical investigation of some dried specimens that were secondarily softened with Na-Phosphate (Gittenberger, in Gasull, 1981). Gasull assigned his alleged new species to *Trochoidea* Brown, 1827.

Bech (1986) reported this species from Zorita del Maestrazgo (Castellón). García-Flor & Robles (1991) used specimens collected in Vistabella del Maestrazgo (Castellón) and Puertomingalvo (Teruel) to characterise details of the shell morphology, using SEM photographs.

A renewed study of the shell and the structure of the genitalia of specimens collected at the type locality and nearby, in combination with a revision of the syntypes, forced us to reconsider the identity of this nominal species.

MATERIAL AND METHODS

Between September 1990 and December 1992, several samples of small xerophilous hygromiid snails were collected at various localities in the "Macizo de Peñagolosa" (Castellón) and at Puertomingalvo (Teruel), a locality nearby. The living snails were found mainly on the vegetation, particularly on *Erinacea anthyllis* Link and to a lesser extent on *Brachipodium retusum* (Persoon) Beauverd. They were not abundant, with two snails at most per plant. Empty shells were collected as well. The snails were anaesthetised, drowned in water with some menthol crystals, and finally preserved in alcohol 70°.

The genitalia of 35 specimens were studied after dissection and the various parts were measured. Height and width of 111 shells were also measured.

For distribution maps the UTM system was used, with 10-km squares for data from the literature (fig. 5a) and 2-km squares for the more precisely located new records (fig. 5b).

For identifications we considered publications by Soós (1926), Fez (1944), Ortiz de Zárate (1950), Aparicio (1983), Faci (1991) and Gittenberger (1993). In addition, the type series of *Trochoidea llopisi* from the Gasull collection at the "Museu de Zoologia de Barcelona" (= MZB) was studied. To stabilize the nomenclature a lectotype (fig. 1) was selected from this material.

RESULTS

The newly collected material. – Upon dissection of the genitalia of conchologically similar specimens collected at the original localities ("Peñagolosa, Cima 1.813 m" and "San Juan de Peñagolosa") it turned out that two genera are represented in that area, both by a single species, viz. *Trochoidea geyeri* (Soós, 1926) and *Candidula camporobensis* (Fez, 1944). In total, 18 snails were dissected and 66 shells were measured, that proved to belong to the former species. For the latter species these number are 17 and 45, respectively.

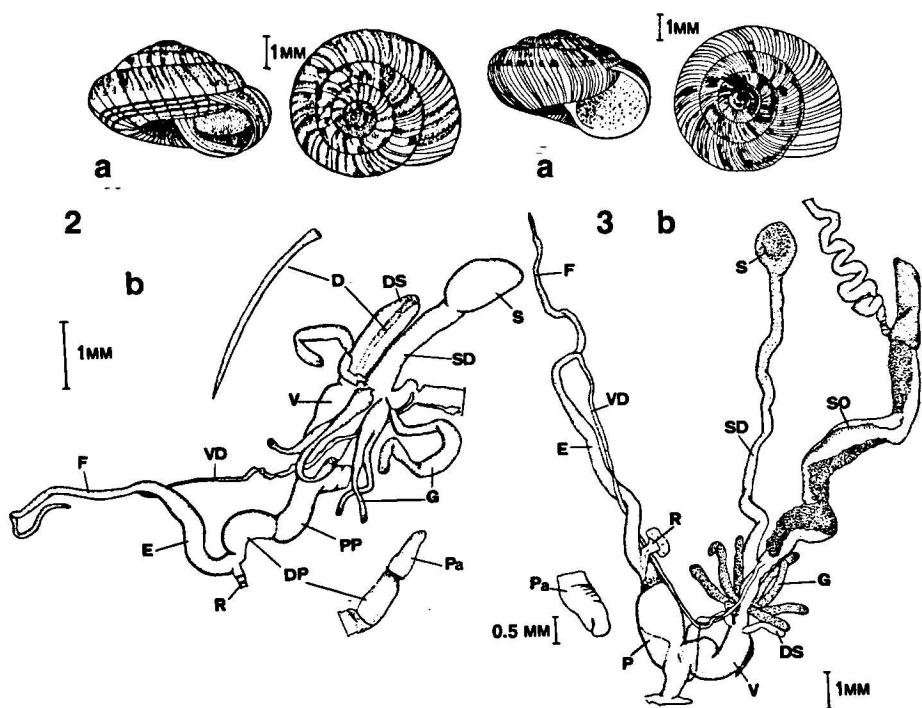
Trochoidea geyeri, a species wide-spread but uncommon in central and western Europe, was first cited from the Iberian Peninsula, i.e. the northern part of Aragón, by Altimira (1970). Aparicio (1983), Puente & Prieto (1992) and Gittenberger (1993) reported it additionally from the central part of the peninsula, whereas Faci (1991) mentioned the species from all over Aragón. *C. camporobensis* is still poorly known; apparently it is endemic to eastern Spain (Altonaga et al., 1994: 125).

Trochoidea Brown, 1827, is characterised by the presence of two small, rudimentary dart-sacs, without darts. In *Candidula* Kobelt, 1871, there seems to be only a single, large dart-sac, with a dart (Ortiz de Zárate, 1950; Bonavita, 1965; Manga, 1983; Gittenberger et al., 1970; Aparicio, 1986; Prieto, 1986; Gittenberger, 1993), but see Hausdorf (1988), who demonstrated that this is an oversimplification. We have studied the structure of the genitalia only for the identifications, not going into much detail.

In *Trochoidea geyeri* the shell (table 2; figs 1, 3a, 4) is up to 5.9 mm high and 9.1 mm broad, whereas in *Candidula camporobensis* (table 1; fig. 2a) these measurements are 3.5



Fig. 1. *Trochoidea geyeri* (Soós, 1926), lectotype of *Trochoidea (Xerocrassa) llopisi* Gasull, 1981 (MZB 84-7285A San Juan de Peñagolosa, province of Castellón, Spain. Scale bar, 1.5 mm.



Figs 2-3. Two partly sympatric species from the massif of Peñagolosa, province of Castellón, Spain. 2, *Candidula camporoblensis* (Fez, 1944); a, shell, drawing accentuating the characteristics; b, genitalia. 3, *Trochoidea geyeri* (Soós, 1926); a, shell, drawing accentuating the characteristics; b, genitalia. Abbreviations: DP, distal part of the penis; Pa, penial papilla; PP, proximal part of the penis; R, penial retractor muscle; VD, vas deferens.

mm and 5.25 mm, respectively. Shells of the former species can also be distinguished from those of the latter one by the more convex whorls, the larger reflection of the peristome over the umbilicus (which is proportionally more narrow, therefore), the more roundish aperture, and the structure of the ribs, which are less coarse. See tables 1 and 2 for data on the genitalia of the two species.

The type series of *Trochoidea llopisi* in the Gasull collection (MZB). – In the Gasull collection (MZB) there are two samples labelled "Xeroplexa llopisi": no. 84-7284 "Xeroplexa llopisi Gas. Peñagolosa, cima 1800 m, 25-6-46", with five [according to an additional note the original number] conspecific shells, three of which adult and two juvenile, all belonging to *Trochoidea geyeri*; no. 84-7285 "Xeroplexa llopisi Gas., 6-12-75, San Juan de Peñagolosa", with 54 [originally "76"] shells, only ten of which are adult. Six of the adult shells in the latter sample are *Trochoidea geyeri* and four are *Candidula camporobrensis*.

DISCUSSION

Gasull (1981) did not designate a holotype for *Trochoidea llopisi*, a name obviously referring to two species that are not even congeneric. To stabilize the nomenclature, we here select as lectotype [sub 84-7285A] from among the syntypes the shell that was figured by Gasull (1981: 96, fig. 2), which belongs to *Trochoidea geyeri*. As a consequence, *Trochoidea llopisi*, with "San Juan de Peñagolosa" as its type locality, becomes a junior



Fig. 4. *Trochoidea geyeri* (Soós, 1926). SEM photograph of the shell microsculpture, with some hair scars indicated by arrows. Scale bar, 362 µm.

	Fez 1944	Ortiz de Zárate 1950	Aparicio 1982	Faci 1991	This paper
Genitalia					n = 17
G	-	5	3-6	5	6-8
P	-	-	1.7-2.5	3.2	1.45-1.7
P+E	-	5.0	-	-	-
E	-	-	1.4-2.9	1.1	1.75-2.25
F	-	2.3	3.05-3.8	3.6	3.50-3.80
DS	-	-	4.4-3.1	2.5	-
D	-	-	1.8-2.6	-	2.60-3.30
SD	-	3.0	1.5-3.0	3.4	1.55-1.85
S	-	1.5	0.5-1.2	0.8	0.75-1.15
Shell					n = 45
Dmx	4.5	-	-	5.25	5.25
Hmx	3	-	-	3	3.5

Table 1. Measurements of the shell and parts of the genitalia in *Candidula camporoblensis* (Fez, 1944). Abbreviations: D, Dart; Dmx, maximum diameter; DS, dart-sac; E, epiphallus; F, flagellum; G, glandulae mucosae; Hmx, maximum height; P, penis; S, spermatheca; SD, spermatheca duct; V, vagina.

	Soós 1926	Gasull 1981	Aparicio 1983	Faci 1991	Gittenberger 1993	This paper 1993
Genitalia					n = 18	
G	-	-	4-7	5-7	5-7	5
P	-	-	2.4-4.4	1.8	2-2.9	3.3
P+E	-	-	-	8.6	-	7.3
E	-	-	4.1-7.8	5.5	5.9-6.1	5.3
F	-	-	2.5-5.5	3.3	3.2-4	3.6
DS	-	-	-	1	0.9-1.2	1.2
SD	-	-	6.8-12.9	5.2	8.4-8.5	6.3
S	-	-	0.8-2.2	2.7x0.7	1.5x1-1.1x1	1.8x0.6
Shell					n = 66	
Dmx	6.8	7.0	7-7.9	9.05	8.0	9.1
Hmx	4.8	4.3	5-6	6.85	6.0	5.9

Table 2. Measurements of the shell and parts of the genitalia in *Trochoidea geyeri* (Soós, 1926). Abbreviations: D, Dart; Dmx, maximum diameter; DS, dart-sac; E, epiphallus; F, flagellum; G, glandulae mucosae; Hmx, maximum height; P, penis; S, spermatheca; SD, spermatheca duct; SO, spermoviduct; V, vagina.

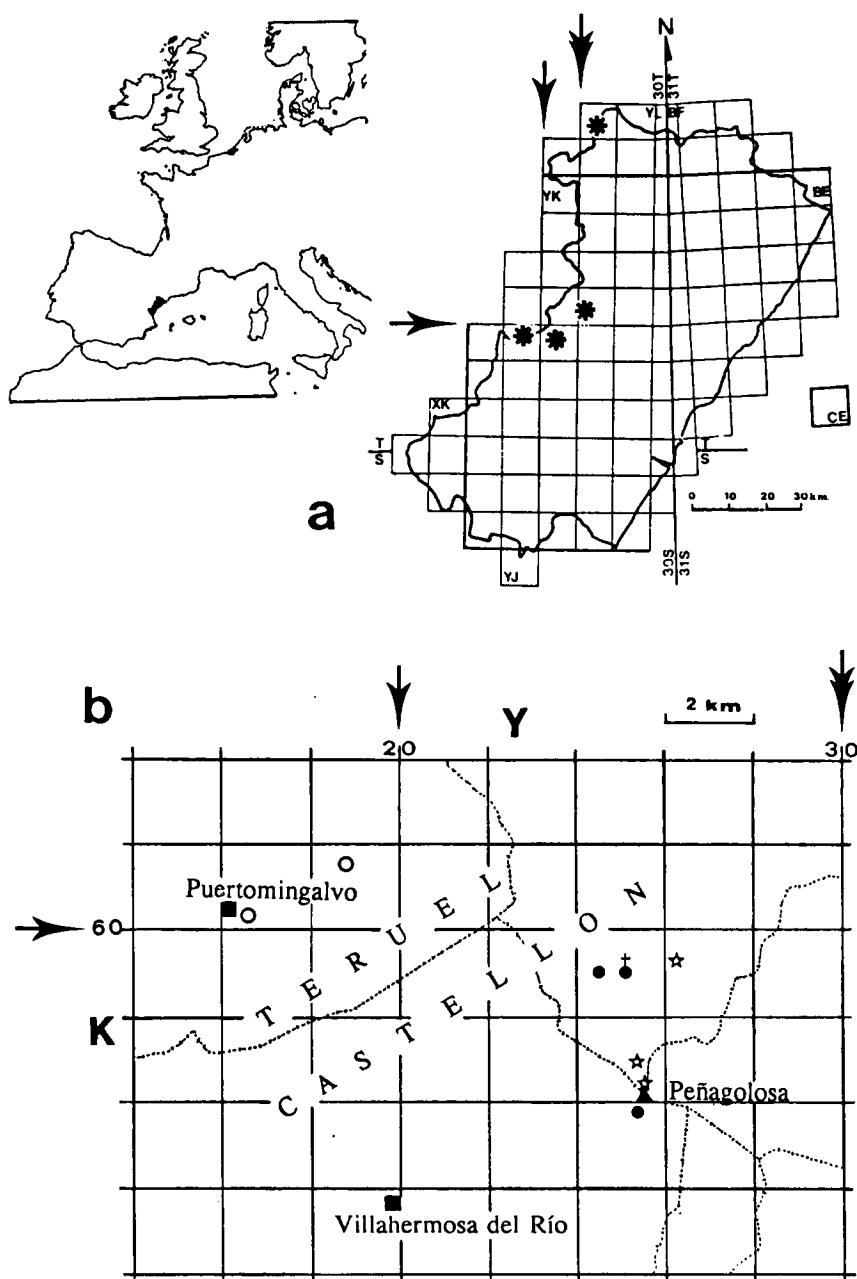


Fig. 5. a, Western Europe with the province of Castellón, Spain, darkened (left) and enlarged (right), with asterisks indicating records for *Trochoidea llopisi* in the literature; b, UTM 2-km squares map of the research area (full squares representing villages and a triangle the mountain Peñagolosa), with dots for records of both *T. geyeri* and *C. camporobrensis*, circles for only *C. camporobrensis*, and stars for *T. geyeri*.

synonym of *T. geyeri*. For unclear reasons, the dimensions of the lectotype (6.2 x 3.8 mm) do not correspond with those given by the author (7 x 4.3 mm).

The shell reported by Bech (1986) belongs to either *T. geyeri* or *C. camporobensis*. We studied the specimens mentioned by García-Flor & Robles (1991) and could identify these as *C. camporobensis*.

This is the first record for *Candidula camporobensis* from the province of Castellón, and the first one for *Trochoidea geyeri* from the province of Valencia. For both species the known ranges are enlarged by these records (fig. 5).

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RESUMEN

Se revisa el material tipo utilizado por Gasull (1981) para la descripción original de *Trochoidea llopisi*. Se compara este material con el colectado por los autores en la localidad típica. Se concluye que el material tipo pertenece a dos especies diferentes: *Trochoidea geyeri* (Soós, 1926) y *Candidula camporobrensis* (Fez, 1944). Por otra parte, el lectotipo, figurado por el autor (Gasull, 1981), es *Trochoidea geyeri*. Por lo tanto, se considera *Trochoidea llopisi* Gasull, 1981, como un sinónimo posterior de *Trochoidea geyeri*.